

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application.

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1. (previously presented) An apparatus for cooling a plurality of assemblies, comprising:

an enclosure configured to form a plurality of tiers stacked along a longitudinal dimension, the plurality of tiers including a first tier;

10 wherein each tier of the plurality of tiers has opposite first and second longitudinal ends with respect to the longitudinal dimension;

wherein each tier is configured to support one or more assemblies of the plurality of assemblies;

15 wherein the one or more assemblies that the first tier is configured to support comprise a plurality of planar cards stacked along a first lateral dimension, with respect to the longitudinal dimension, across the first tier;

wherein the enclosure defines a distribution plenum longitudinally contiguous to the first longitudinal end of the first tier, the distribution plenum being configured to distribute received coolant through the first longitudinal end of the first tier.

20 wherein the enclosure further defines an exhaust plenum longitudinally contiguous to the second longitudinal end of the first tier, the exhaust plenum being configured to channel away coolant received from the second longitudinal end of the first tier; and

25 wherein the enclosure is configured such that coolant supplied to the distribution plenum is received into the enclosure in a direction along a second lateral dimension with respect to the longitudinal dimension, and such that coolant received by the exhaust plenum is channeled out of the enclosure in the direction along the second lateral dimension.

2. (canceled)

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3. (previously presented) The apparatus of claim 1, and further comprising a pump configured to pump coolant such that it passes sequentially through the distribution plenum, the tier, and the exhaust plenum, wherein:

the enclosure includes a pump plenum configured to laterally receive the coolant received into the enclosure;

the pump is configured to receive coolant from the pump plenum; and
the tier is configured to receive coolant from the pump.

4. (canceled)

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5. (canceled)

6. (canceled)

15 7. (original) The apparatus of claim 1, wherein the enclosure further defines a separate distribution plenum for each tier, each distribution plenum being contiguous to the first longitudinal end of its respective tier, and being configured to distribute received coolant through the first longitudinal end of its respective tier.

20 8. (original) The apparatus of claim 7, wherein the enclosure is configured such that coolant supplied to each distribution plenum is drawn laterally into the enclosure, with respect to the longitudinal dimension, at a level-side location longitudinally adjacent the distribution plenum.

25 9. (original) The apparatus of claim 7, wherein the enclosure further defines a separate exhaust plenum for each tier, each exhaust plenum being contiguous to the second longitudinal end of its respective tier, and being configured to channel away coolant received from the second longitudinal end of its respective tier.

10. (original) The apparatus of claim 9, wherein the enclosure is configured such that coolant received by the exhaust plenum is channeled laterally out of the enclosure, with respect to the longitudinal dimension, at a level-side location longitudinally aligned with the exhaust plenum.

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11. (original) The apparatus of claim 9, wherein the enclosure is configured such that coolant supplied to each distribution plenum is drawn laterally into the enclosure, with respect to the longitudinal dimension, at a level-side location longitudinally adjacent the distribution plenum, and such that coolant received by the exhaust plenum is channeled laterally out of the enclosure, with respect to the longitudinal dimension, at a level-side location longitudinally aligned with the exhaust plenum.

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12. (canceled)

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13. (original) The apparatus of claim 1, wherein the distribution plenum includes a wall defining a boundary between the distribution plenum and the first longitudinal end of the first tier, the wall including a plurality of orifices configured to direct coolant received by the distribution plenum through the first tier at selected locations.

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14. (currently amended) The apparatus of claim 13, wherein the plurality of orifices are configured as downward pointing jets.

15. (previously presented) The apparatus of claim 24, wherein the jets direct streams of coolant toward the plurality of assemblies.

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16. (previously presented) The apparatus of claim 24, wherein the jets are configured as slots that emit streams forming sheets of coolant.

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17. (previously presented) The apparatus of claim 24, wherein the jets emit coolant at a velocity of at least 4 m/s.

18. (previously presented) The apparatus of claim 24, wherein the jets emit coolant at a velocity of at least 6 m/s.

19. (previously presented) The apparatus of claim 24, wherein the jets emit coolant at a velocity of at least 6 m/s and no more than 8 m/s.

20. (canceled)

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21. (canceled)

22. (canceled)

10 23. (canceled)

24. (currently amended) An apparatus for cooling a plurality of assemblies, comprising:

an enclosure configured to form a plurality of tiers stacked in a longitudinal dimension, the plurality of tiers including a first tier;

wherein each tier of the plurality of tiers has opposite first and second longitudinal ends with respect to the longitudinal dimension;

wherein each tier is configured to support one or more assemblies of the plurality of assemblies;

20 wherein the enclosure defines a distribution plenum longitudinally contiguous to the first longitudinal end of the first tier, the distribution plenum being configured to distribute received coolant through the first longitudinal end of the first tier;

wherein the distribution plenum includes a wall defining a boundary between the distribution plenum and the first longitudinal end of the first tier, the wall including a plurality of orifices configured to direct coolant received by the distribution plenum through the first tier at selected locations; and

25 wherein the plurality of orifices are configured as downward pointing jets.

25. (previously presented) The apparatus of claim 24, and further comprising a pump:

wherein the enclosure includes a pump plenum configured to laterally receive the coolant received into the enclosure;

5 wherein the pump is configured to receive coolant from the pump plenum; and wherein the jets are configured to receive coolant from the pump.

26. (previously presented) The apparatus of claim 24, wherein the jets are point jets targeted at components.

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27. (previously presented) The apparatus of claim 1, wherein the first lateral dimension is normal to the second lateral dimension.

15 28. (previously presented) The apparatus of claim 1, wherein the one or more assemblies that the first tier is configured to support further comprise a second plurality of planar cards stacked along the first lateral dimension across the first tier, and further comprising a substantially non-vented mid-plane between the first and second plurality of planar cards, wherein the mid-plane is normal to the second lateral dimension.

29. (previously presented) An method of cooling a plurality of assemblies in an enclosure configured to form a plurality of tiers stacked along a longitudinal dimension, each tier being configured to support one or more assemblies of the plurality of assemblies, the plurality of tiers including a first tier, wherein each tier of the plurality of tiers has opposite first and second longitudinal ends with respect to the longitudinal dimension, and wherein the one or more assemblies that the first tier is configured to support comprise a plurality of planar cards stacked along a first lateral dimension, with respect to the longitudinal dimension, across the first tier, comprising:

5 laterally receiving coolant, along a second lateral dimension with respect to the longitudinal dimension, into a distribution plenum defined by the enclosure, the distribution plenum being longitudinally contiguous to the first longitudinal end of the first tier;

10 longitudinally distributing the coolant from the distribution plenum into the first longitudinal end of the first tier;

15 longitudinally receiving the coolant from the second longitudinal end of the first tier into an exhaust plenum defined by the enclosure, the exhaust plenum being longitudinally contiguous to the second longitudinal end of the first tier;

20 laterally exhausting the coolant from the exhaust plenum in the direction along the second lateral dimension.

30. (previously presented) The method of claim 29, wherein in the step of longitudinally distributing, the coolant is pumped through jets configured to direct streams of coolant toward the plurality of assemblies.

25 31. (new) The apparatus of claim 24, wherein the one or more assemblies that the first tier is configured to support further comprise a second plurality of planar cards stacked along the first lateral dimension across the first tier, and further comprising a substantially non-vented mid-plane between the first and second plurality of planar cards, wherein the mid-plane is normal to the second lateral dimension.

32. (new) An apparatus for cooling a plurality of assemblies, comprising:
an enclosure configured to form a plurality of tiers stacked in a longitudinal dimension, the plurality of tiers including a first tier; and
a pump;
5 wherein each tier of the plurality of tiers has opposite first and second longitudinal ends with respect to the longitudinal dimension;
wherein each tier is configured to support one or more assemblies of the plurality of assemblies;
wherein the enclosure defines a distribution plenum longitudinally contiguous to
10 the first longitudinal end of the first tier, the distribution plenum being configured to distribute received coolant through the first longitudinal end of the first tier;
wherein the distribution plenum includes a wall defining a boundary between the distribution plenum and the first longitudinal end of the first tier, the wall including a plurality of orifices configured to direct coolant received by the distribution plenum
15 through the first tier at selected locations;
wherein the plurality of orifices are configured as jets;
wherein the enclosure includes a pump plenum configured to laterally receive the coolant received into the enclosure;
wherein the pump is configured to receive coolant from the pump plenum; and
20 wherein the jets are configured to receive coolant from the pump.

33. (new) The apparatus of claim 32, wherein the one or more assemblies that the first tier is configured to support further comprise a second plurality of planar cards stacked along the first lateral dimension across the first tier, and further comprising a substantially non-vented mid-plane between the first and second plurality of planar cards, wherein the mid-plane is normal to the second lateral dimension.
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34. (new) An apparatus for cooling a plurality of planar cards, comprising:
an enclosure configured to form a plurality of tiers stacked along a longitudinal dimension, including a first tier;
wherein each tier of the plurality of tiers has opposite first and second longitudinal ends with respect to the longitudinal dimension;
5 wherein the first tier is configured to support a first group of planar cards, from among the plurality of planar cards, the first group of planar cards being stacked along a lateral dimension, with respect to the longitudinal dimension, across the tier;
wherein the first tier is further configured to support a second group of planar cards, from among the plurality of planar cards, the second group of planar cards being stacked along the lateral dimension across the first tier;
10 wherein the first tier further comprises a substantially non-vented mid-plane extending along the lateral dimension between the first and second groups of planar cards; and
wherein the enclosure defines a first plenum longitudinally contiguous to the first longitudinal end of each tier, each first plenum being configured to at least one of distribute or exhaust coolant through the first longitudinal end of the first tier.

35. (new) The apparatus of claim 34, wherein:
each first plenum is a distribution plenum configured to distribute received coolant through the first longitudinal end of its respective tier;
the enclosure further defines an exhaust plenum longitudinally contiguous to the second longitudinal end of each tier, each exhaust plenum being configured to channel away coolant received from the second longitudinal end of its respective tier; and
25 the enclosure is configured such that coolant supplied to the distribution plenum is received laterally into the enclosure, and such that coolant received by the exhaust plenum is channeled laterally out of the enclosure.

36. (new) The apparatus of claim 35, wherein:
the enclosure is configured such that coolant supplied to the distribution plenum is received into the enclosure in a direction along a second lateral dimension with respect to the longitudinal dimension, and such that coolant received by the exhaust plenum is channeled out of the enclosure in the direction along the second lateral dimension.

37. (new) The apparatus of claim 34, and further comprising a pump:
wherein the enclosure includes a pump plenum configured to laterally receive the
coolant received into the enclosure;
wherein the pump is configured to receive coolant from the pump plenum; and
5 wherein jets are configured to receive coolant from the pump and direct coolant
longitudinally toward the cards.